SWRHL-105r

PROJECT GASBUGGY
OFF-SITE RADIOLOGICAL SAFETY REPORT
GB-2R PHASE I PROGRAM

by
Technical Support Section
Environmental Surveillance
Southwestern Radiological Health Laboratory

U. S. Department of Health, Education, and Welfare
Public Health Service
Environmental Health Service
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Bureau of Radiological Health

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ABSTRACT

The Southwestern Radiological Health Laboratory provided off-site radiological surveillance for the Gasbuggy-2 Redrill (GB-2R) - Phase I program. This surveillance was the continuation of the previous off-site surveillance program for Gasbuggy, and consisted of:

a. Operating a daily air sampling network.
b. Placing thermoluminescent dosimeters in a network around the site.
c. Monitoring for radioactivity.
d. Taking special air samples during flaring operations.
e. Collecting water, vegetation, and soil samples after completion of testing operations.

The only radioactivity above background levels detected off-site was in special air samples. These samples contained tritium concentrations above background; the concentrations found presented no hazard to any people or livestock living in the off-site area.

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INTRODUCTION

The Southwestern Radiological Health Laboratory (SWRHL) provided off-site radiological surveillance for the Gasbuggy-2 Redrill (GB-2R) - Phase I Program. This surveillance was the continuation of the previous off-site surveillance program for Gasbuggy. The previous program consisted of pre-shot preparations, shot monitoring operations (D-10 to D+10) and the redrill into the cavity through the Emplacement hole (GB-E); this program was completed by mid-January, 1968.[1]

Prior to the original drilling of the GB-E, two wells were drilled, Gasbuggy-1 (GB-1) and Gasbuggy-2 (GB-2). The GB-2R Phase I program consisted of redrilling the GB-2 and flaring gas from the cavity for 15 days. The gas actually flowed from the GB-E redrill well since technical difficulties prevented any major flowing from GB-2R well. The SWRHL surveillance program lasted from mid-June 1968 until mid-July 1968.

The Public Health Service conducted this program of radiological environmental surveillance of the off-site area for the Safety Evaluation Division of the AEC's Nevada Operations Office under a Memorandum of Understanding between the U. S. Atomic Energy Commission (AEC) and the Public Health Service (PHS). The safety criteria were unchanged.[2]

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1 Report of Off-Site Surveillance for Project Gasbuggy, March 1967 to June 1968-SWRHL-99r, February 1970.

2 Off-Site Radiological Safety Operational Plan for Project Gasbuggy, October 6, 1965.

PERSONNEL AND EQUIPMENT

The field operations were the responsibility of the Gasbuggy Project Officer, who was in the area from June 13 to July 16, 1968. These operations consisted of:

a. Operating a daily air sampling network.
b. Placing thermoluminescent dosimeters in a network around the site.
c. Monitoring for radioactivity.
d. Taking special air samples during flaring operations.
e. Collecting water, vegetation, and soil samples after completion of testing operations.

The Project Officer's vehicle was equipped with a two-way radio, survey instruments, routine and special air sampling equipment, and soil, water, and vegetation sampling equipment. The survey instruments were:

a. Scintillation Survey Instrument, Baird Atomic, Model NE-148, (range of 0.01 mR/hr to 3 mR/hr).
b. Geiger Counter Survey Instrument, E-500B (range of 0.01 mR/hr to 2 R/hr).
c. Ionization Chamber Survey Instrument AGB-50B-SR (Victoreen Radector II with a range of 0.01 mR/hr to 50 R/hr).

MONITORING

Monitoring was first performed during flow meter logging of GB-2R, and again throughout the downwind area during the first eight hours of GB-E flaring. Monitoring was performed by the Project Officer

approximately four days per week during all flaring operations. No levels of radiation above background could be detected in the off-site area with portable survey instruments.

DOSIMETRY

Thermoluminescent dosimeters (TLD's) were stationed around the site at nineteen locations (Figure 1) ranging from 0.1 to 6 miles from surface ground zero (SGZ). TLD's were placed on June 27, 1968, and collected on July 16, 1968. Each station was equipped with three EG&G Model TL-12 CaF:Mn TLD's having a sensitivity range of 1 mR to 5000 R. In addition to the TLD stations, three TLD's were carried by the Project Officer in his vehicle on all of his field operations.

The station locations were selected with regard to predominant wind direction during this period of the year. During daytime hours, the wind moves primarily toward the northeast. At night a stable air condition generally exists and the air "drains" downhill toward the northwest. An array of TLD's was placed from 345° to 180° (Figure 1, stations 4 to 16) at distances of one mile to six miles from SGZ. An arc of three stations (one to three) was placed 1.3 miles northwest of SGZ crossing the valley through which the drainage winds pass. Two stations (17 and 18) were placed approximately six miles northwest of SGZ in the same valley.

The average total exposure recorded at each location over nineteer days is given beside each station in Figure 1. Table 1 gives the exposure for each TLD within the network. The exposure values given in Table 1 show no areas where the exposure level was significantly higher than the background recorded in Farmington.

ENVIRONMENTAL SAMPLING

Environmental sampling consisted of daily air sampling at ten stations, ranging from 5 to 50 miles from SGZ, special air sampling within 0.3 miles of SGZ, and sampling of water, vegetation, and soil following completion of the flaring.

Daily Air Samples

A network of 35 air sampling stations was used for surveillance during Project Gasbuggy. Eleven of the 27 stations established specifically for the event (the remaining eight were ASN or Standby ASN stations) remained on standby following the clean-up after the GB-E redrill. Ten of these eleven operated daily from June 30 to July 18, 1968. These stations were:

Station No.	Location	Station No.	Location
425	Pagosa Springs, Colorado	430	Coyote, New Mexico
426	Dulce, New Mexico	432	Lindreth Plant (EPNG), New Mexico
427	Chama, New Mexico	433	Allison, Colorado
428	Tierra Amarilla, New Mexico	434	Gobernador, New Mexico
429	Canjilon, New Mexico	445	Farmington, New Mexico

Air sampling stations were equipped with air samplers using a positive displacement pump. The filter system used was a 4-inch-diameter glass fiber filter followed by a 4-inch BM 2306 activated charcoal cartridge.

All filters and charcoal cartridges were mailed directly to SWRHL for analysis. The filters were beta counted upon arrival at the laboratory and again on the fifth and twelfth day after collection. If the initial beta count indicated an activity concentration of more

than 1 pCi/m^3, or if the five-day count was more than 150 counts above background, the filter was to be gamma scanned. The charcoal cartridge was gross gamma counted upon arrival and, if the count was greater than 500 counts per minute, the filter and cartridge were to be gamma scanned. No gamma scans were required under these criteria.

The gross beta results for the daily air samples are given in Table 2; the values given for beta counting were extrapolated to end of collection. In several cases the volumes appear to be lower than normal for the period of operation. This is due to the sampler not operating continuously, usually caused by a power failure or disruption. The period of operation is determined by a time meter on each sampler. The analytical results were in agreement with ASN results during the period of operation.

Special Air Samples

Air samples were collected within 0.3 miles of SGZ using two sampling systems. One was a molecular sieve column system which removed the moisture from the air for tritium analysis; the other was a cryogenic system which removed any moisture, xenons, and kryptons for radioanalysis.

The molecular sieve sampler consisted of a column of Linde 13x (pellet form, 1/16-inch diameter) molecular sieve, 4 inches in diameter and 14 inches in length. Air was pulled through the column at approximately 4 cfm. A filter of glass fiber removed particulate material.

The cryogenic system consisted of a cyclone separator and two molecular sieve columns submerged in a bath of liquid nitrogen

maintained at 11 to 15 psig. The separator froze all the moisture and the sieve trapped the portions of air which liquify above 84 K. A glass fiber filter removed particulate material from the air entering the system. The samples were analyzed for tritium and for radioisotopes of xenon and krypton.

The results of the special air samples are given in Table 3. No sample collected had a level of radioactivity which would be considered a hazard to any off-site population. The wide variation of tritium activities prevent any firm conclusions as to higher or lower concentrations due to sampling locations or time. No samples showed any detectable levels of radioxenons or radiokryptons. Two samples can be considered as background. Sample No. 50280 was taken for background information. The sample was taken 0.4 miles downwind from a well drilling operation which was flaring the drilling gas. The operation was located approximately seven miles southwest of surface ground zero. Sample No. 50250 was not intended to be for background information, however, apparently it collected only background levels of tritium. No firm conclusions can be drawn from the limited samples; additional samples should be collected during future surveillance operations.

The highest concentration of tritium found in any of the air samples collected was 1200 pCi/m^3. This was 1.8% of the maximum permissible concentration for continuous exposure to a suitable sample of the population in uncontrolled areas of 6.7×10^4 pCi/m^3 for air.[1]

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[1] AEC Standards for Radiation Protection, Appendix to Chapter 0524, Section II-A.

The sample was taken during stable meteorological conditions which would inhibit diffusion, therefore, it represents a peak value which may have persisted for limited periods.

Water Samples

Following flaring operations, seven samples were taken from open water sources at locations from one to seven miles from SGZ. The results of these samples are given in Table 4. These samples were gamma scanned and analyzed for tritium. All gamma scans showed no detectable activity, and all tritium values were at background levels.

Soil and Vegetation Samples

Soil and vegetation samples were taken following completion of GB-E redrill flaring operations. The samples were taken to determine if any radioactive deposition had taken place downwind. The sampling locations are given in Figure 2. No radioactive deposition was found on the samples; however, it was decided after the samples had been collected to dehydrate a portion and analyze for tritium. The results of the tritium analysis are given in Table 5.

It is difficult to draw conclusions from the results of the tritium analysis on soil and vegetation samples since the sampling scheme for soil and vegetation was not designed for tritium analysis. The soil samples, however, generally show tritium concentration in the recovered water decreasing with distance, while in vegetation the concentration seems to be somewhat constant with increasing distance. The difference between soil and vegetation results might be explained by the mixtures of species in vegetation, while soil composition was probably fairly constant over the area of collection.

SUMMARY

The monitoring and dosimetry operations showed no detectable radioactivity in the off-site area. The environmental sampling program showed no radioactivity above background in daily air samples, or water samples. Levels of tritium above background were found in special air samples which collected moisture from the air and also in soil and vegetation samples. None of the tritium results showed levels which presented a hazard to any people or livestock living in the off-site area.

Table 1. TLD Exposure Results

Station No.	TLD No.	Total Exposure 6/27/68-7/16/68	Station No.	TLD No.	Total Exposure 6/27/68-7/16/68
1	1101	6 mR	12	1131	3 mR
	1102	6 mR		1132	3 mR
	1103	5 mR		1133	3 mR
2	1104	4 mR	13	1134	5 mR
	1105	5 mR		1135	5 mR
	1106	7 mR		1136	5 mR
3	1107	4 mR	14	1137	5 mR
	1108	5 mR		1138	6 mR
	1109	5 mR		1139	5 mR
4	1155	4 mR	15	1140	6 mR
	1156	4 mR		1141	6 mR
	1157	4 mR		1142	5 mR
5	1110	6 mR	16	1143	6 mR
	1111	5 mR		1144	5 mR
	1112	6 mR		1145	5 mR
6	1113	6 mR	17	1146	5 mR
	1114	5 mR		1147	6 mR
	1115	5 mR		1148	6 mR
7	1116	6 mR	18	1149	6 mR
	1117	8 mR		1150	5 mR
	1118	6 mR		1151	5 mR
8	1119	6 mR	19	1152	4 mR
	1120	5 mR		1153	4 mR
	1121	5 mR		1154	4 mR
9	1122	5 mR	Project Officer	1158	4 mR
	1123	-----		1159	5 mR
	1124	5 mR		1160	-----
10	1125	6 mR	Controls-Farmington	1161	3 mR
	1126	5 mR		1162	8 mR
	1127	5 mR		1163	5 mR
				1164	6 mR
11	1128	5 mR		1165	5 mR
	1129	5 mR			
	1130	5 mR			

Table 2. Daily Air Sampling Results*

Sampling Locations	Station No.	Sampling Period Start Day	Start Hour	Stop Day	Stop Hour	Sample Volume (m^3)	Beta Activity (pCi/m^3)	Integra Beta Acti (pCi-hr/
Pagosa Springs, Colorado	425	June	21 1755	23	1210	811	0.2	7.7
			23 1210	24	1750	543	0.1	4.1
			24 1751	25	2105	522	0.5	13.7
			25 2115	27	1702	893	0.3	14.7
			27 1703	28	2235	525	0.4	10.0
			28 2245	30	1000	711	0.2	7.0
			30 1001	1	1845	650	0.5	18.0
		July	1 1846	5	0900	1697	0.2	13.3
			5 0901	7	1627	1152	0.1	6.6
			7 1628	9	2015	1020	0.1	6.6
			9 2017	10	1759	447	0.1	1.5
			10 1800	11	1950	524	0.1	2.6
Dulce, New Mexico	426	June	21 0945	22	1615	600	0.1	2.9
			22 1620	24	0800	818	0.1	4.5
			24 0805	25	0808	499	0.3	6.9
			25 0812	26	0815	497	0.4	9.2
			26 0815	27	0815	495	0.3	6.1
			27 0818	28	0900	511	0.3	6.5
			28 0905	1	0830	1477	0.2	15.2
		July	1 0835	2	0818	495	0.3	7.3
			2 0820	3	0825	499	0.1	2.1
			3 0830	5	0800	957	0.1	4.3
			5 0800	6	0908	548	0.1	2.5
			6 0915	7	1435	635	0.4	1.0
			7 1440	8	0820	385	0.1	2.1
			8 0825	9	0840	528	0.2	4.2
			9 0843	10	0819	513	0.1	1.9
			10 0823	11	1015	563	ND	ND
			11 1018	12	0820	478	0.1	2.6
			12 0824	15	0920	1533	0.1	6.3
			15 0920	17	0845	984	0.1	4.0
			17 0848	18	0950	546	ND	ND

*No gamma scans were made on filters or charcoal cartridges since none were required under the criteria set forth on Page 4 of this report.

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Table 2. Daily Air Sampling Results*

ations	Station No.	Sampling Period Start		Stop		Sample Volume (m^3)	Beta Activity (pCi/m^3)	Integrated Beta Activity (pCi-hr/m^3)
		Day	Hour	Day	Hour			
s,	425	June	21 1755	23	1210	811	0.2	7.7
			23 1210	24	1750	543	0.1	4.1
			24 1751	25	2105	522	0.5	13.7
			25 2115	27	1702	893	0.3	14.7
			27 1703	28	2235	525	0.4	10.0
			28 2245	30	1000	711	0.2	7.0
			30 1001	1	1845	650	0.5	18.0
		July	1 1846	5	0900	1697	0.2	13.3
			5 0901	7	1627	1152	0.1	6.6
			7 1628	9	2015	1020	0.1	6.6
			9 2017	10	1759	447	0.1	1.5
			10 1800	11	1950	524	0.1	2.6
lexico	426	June	21 0945	22	1615	600	0.1	2.9
			22 1620	24	0800	818	0.1	4.5
			24 0805	25	0808	499	0.3	6.9
			25 0812	26	0815	497	0.4	9.2
			26 0815	27	0815	495	0.3	6.1
			27 0818	28	0900	511	0.3	6.5
			28 0905	1	0830	1477	0.2	15.2
		July	1 0835	2	0818	495	0.3	7.3
			2 0820	3	0825	499	0.1	2.1
			3 0830	5	0800	957	0.1	4.3
			5 0800	6	0908	548	0.1	2.5
			6 0915	7	1435	635	0.4	1.0
			7 1440	8	0820	385	0.1	2.1
			8 0825	9	0840	528	0.2	4.2
			9 0843	10	0819	513	0.1	1.9
			10 0823	11	1015	563	ND	ND
			11 1018	12	0820	478	0.1	2.6
			12 0824	15	0920	1533	0.1	6.3
			15 0920	17	0845	984	0.1	4.0
			17 0848	18	0950	546	ND	ND

ans were made on filters or charcoal cartridges since none were required
teria set forth on Page 4 of this report.

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Table 2. Daily Air Sampling Results (continued)

Sampling Locations	Station No.	Sampling Period Start		Stop		Sample Volume (m^3)	Beta Activity (pCi/m^3)	Inte Beta A (pCi-l
		Day	Hour	Day	Hour			
Chama, New Mexico	427	June 21	1230	22	0900	425	0.2	3.
		22	0900	23	1800	705	0.1	4.
		23	1805	24	0600	259	0.1	1.
		24	0600	25	1200	626	0.4	11.
		25	1204	26	0915	450	0.6	11.
		26	0917	27	1300	589	0.3	9.
		27	1300	28	0915	431	0.7	14.
		28	0920	29	0900	517	0.3	7.
		29	0900	30	1100	565	0.3	6.
		30	1100	1	1000	489	0.7	16.
		July 1	1000	2	0800	489	0.3	1.
		2	0800	3	0800	520	0.2	3.
		3	0800	4	1400	648	0.1	4.
		4	1400	5	0800	391	0.2	3.
		5	0800	6	0820	504	0.1	2.
		6	0825	7	1230	634	0.1	1.
		7	1230	10	1200	1522	0.2	11.
		11	1100	12	1200	528	0.1	2.
		12	1200	13	0800	444	0.2	3.
		13	0800	14	1120	596	0.2	5.
		14	1125	15	1000	476	0.1	2.
		15	1000	16	1130	567	0.1	3.
		16	1130	17	1400	567	0.1	3.
		17	1400	18	1400	522	ND	N
Tierra Amarilla, New Mexico	428	June 21	0930	22	1000	533	0.1	2.
		22	1000	23	1000	522	0.2	4.
		23	1005	24	1002	520	0.1	3.
		24	1007	25	1005	515	0.4	8.
		25	1008	26	0955	517	0.4	9.
		26	1000	27	1014	526	0.3	6.
		27	1015	28	1010	520	0.6	14.
		28	1013	29	1013	522	0.3	6.
		29	1015	30	1015	522	0.2	5.
		30	1015	1	1040	545	0.6	14.
		July 1	1044	2	1010	507	0.2	5.
		2	1013	3	1000	517	0.1	2.
		3	1004	4	1003	522	0.1	2.
		4	1007	5	1000	520	0.2	3.

Table 2. Daily Air Sampling Results (continued)

ations	Station No.	Sampling Period Start		Stop		Sample Volume (m^3)	Beta Activity (pCi/m^3)	Integrated Beta Activity ($pCi\text{-}hr/m^3$)
		Day	Hour	Day	Hour			
Mexico	427	June	21 1230	22	0900	425	0.2	3.4
			22 0900	23	1800	705	0.1	4.7
			23 1805	24	0600	259	0.1	1.7
			24 0600	25	1200	626	0.4	11.6
			25 1204	26	0915	450	0.6	11.8
			26 0917	27	1300	589	0.3	9.4
			27 1300	28	0915	431	0.7	14.1
			28 0920	29	0900	517	0.3	7.1
			29 0900	30	1100	565	0.3	6.7
			30 1100	1	1000	489	0.7	16.4
		July	1 1000	2	0800	489	0.3	1.5
			2 0800	3	0800	520	0.2	3.3
			3 0800	4	1400	648	0.1	4.8
			4 1400	5	0800	391	0.2	3.3
			5 0800	6	0820	504	0.1	2.6
			6 0825	7	1230	634	0.1	1.6
			7 1230	10	1200	1522	0.2	11.5
			11 1100	12	1200	528	0.1	2.8
			12 1200	13	0800	444	0.2	3.2
			13 0800	14	1120	596	0.2	5.7
			14 1125	15	1000	476	0.1	2.6
			15 1000	16	1130	567	0.1	3.4
			16 1130	17	1400	567	0.1	3.3
			17 1400	18	1400	522	ND	ND
lla,	428	June	21 0930	22	1000	533	0.1	2.9
			22 1000	23	1000	522	0.2	4.4
			23 1005	24	1002	520	0.1	3.3
			24 1007	25	1005	515	0.4	8.4
			25 1008	26	0955	517	0.4	9.8
			26 1000	27	1014	526	0.3	6.2
			27 1015	28	1010	520	0.6	14.0
			28 1013	29	1013	522	0.3	6.9
			29 1015	30	1015	522	0.2	5.4
			30 1015	1	1040	545	0.6	14.8
		July	1 1044	2	1010	507	0.2	5.5
			2 1013	3	1000	517	0.1	2.3
			3 1004	4	1003	522	0.1	2.7
			4 1007	5	1000	520	0.2	3.9

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Table 2. Daily Air Sampling Results (continued)

Sampling Locations	Station No.	Sampling Period Start		Sampling Period Stop		Sample Volume (m^3)	Beta Activity (pCi/m^3)	Integrat Beta Acti (pCi-hr/
		Day	Hour	Day	Hour			
Tierra Amarilla, New Mexico(continued)	428	July 5	1004	6	1045	539	0.1	2.0
		6	1100	7	1025	509	ND	ND
		7	1030	8	1002	511	ND	ND
		8	1005	9	1005	522	0.1	1.4
		9	1007	10	1009	524	0.1	2.3
		10	1013	11	1019	524	0.1	1.4
		11	1022	12	1015	520	0.1	1.7
		17	1300	18	1300	520	0.1	2.3
Canjilon, New Mexico	429	June 21	1200	22	1200	485	0.1	3.1
		22	1200	23	1200	472	0.2	3.7
		23	1200	24	1200	472	0.1	3.1
		24	1200	25	1200	485	0.4	9.7
		25	1200	26	1200	472	0.6	14.6
		26	1200	27	1200	472	0.3	6.2
		27	1200	28	1200	472	0.8	18.8
		28	1200	29	1200	485	0.3	6.4
		29	1200	30	1200	485	0.3	8.0
		30	1200	1	1200	472	0.6	15.5
		July 1	1200	2	1200	472	0.2	4.8
		2	1200	3	1200	485	0.1	3.1
		3	1204	4	1200	485	0.2	4.5
		4	1200	5	1200	472	0.2	4.1
		5	1200	6	1200	485	ND	ND
		6	1200	7	1200	472	0.1	2.4
		7	1200	8	1200	485	0.1	3.1
		8	1200	9	1200	485	0.1	3.1
		9	1200	10	1200	485	0.1	2.6
		10	1200	11	1200	485	0.1	2.4
		11	1200	12	1200	472	0.1	1.9
		12	1200	13	1200	472	0.2	4.3
		13	1200	14	1200	472	0.2	4.7
		14	1200	15	1200	485	0.1	2.3
		15	1200	16	1200	485	0.2	4.3
		16	1200	17	1200	485	0.1	2.3
		17	1200	18	1200	485	0.2	0.5
Coyote, New Mexico	430	June 21	1115	22	0845	405	0.2	4.5
		22	1100	23	0635	364	0.2	3.5

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Table 2. Daily Air Sampling Results (continued)

Locations	Station No.	Sampling Period Start Day	Start Hour	Stop Day	Stop Hour	Sample Volume (m^3)	Beta Activity (pCi/m^3)	Integrated Beta Activity ($pCi\text{-}hr/m^3$)
arilla, co(continued)	428	July	5 1004	6	1045	539	0.1	2.0
			6 1100	7	1025	509	ND	ND
			7 1030	8	1002	511	ND	ND
			8 1005	9	1005	522	0.1	1.4
			9 1007	10	1009	524	0.1	2.3
			10 1013	11	1019	524	0.1	1.4
			11 1022	12	1015	520	0.1	1.7
			17 1300	18	1300	520	0.1	2.3
lew Mexico	429	June	21 1200	22	1200	485	0.1	3.1
			22 1200	23	1200	472	0.2	3.7
			23 1200	24	1200	472	0.1	3.1
			24 1200	25	1200	485	0.4	9.7
			25 1200	26	1200	472	0.6	14.6
			26 1200	27	1200	472	0.3	6.2
			27 1200	28	1200	472	0.8	18.8
			28 1200	29	1200	485	0.3	6.4
			29 1200	30	1200	485	0.3	8.0
			30 1200	1	1200	472	0.6	15.5
		July	1 1200	2	1200	472	0.2	4.8
			2 1200	3	1200	485	0.1	3.1
			3 1204	4	1200	485	0.2	4.5
			4 1200	5	1200	472	0.2	4.1
			5 1200	6	1200	485	ND	ND
			6 1200	7	1200	472	0.1	2.4
			7 1200	8	1200	485	0.1	3.1
			8 1200	9	1200	485	0.1	3.1
			9 1200	10	1200	485	0.1	2.6
			10 1200	11	1200	485	0.1	2.4
			11 1200	12	1200	472	0.1	1.9
			12 1200	13	1200	472	0.2	4.3
			13 1200	14	1200	472	0.2	4.7
			14 1200	15	1200	485	0.1	2.3
			15 1200	16	1200	485	0.2	4.3
			16 1200	17	1200	485	0.1	2.3
			17 1200	18	1200	485	0.2	0.5
Mexico	430	June	21 1115	22	0845	405	0.2	4.5
			22 1100	23	0635	364	0.2	3.5

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Table 2. Daily Air Sampling Results (continued)

Sampling Locations	Station No.	Sampling Period Start		Stop		Sample Volume (m^3)	Beta Activity (pCi/m^3)	Integ Beta A (pCi-h
		Day	Hour	Day	Hour			
Coyote, New Mexico (continued)	430	June	23 0740	24	0730	446	0.2	4.
			24 0830	25	0730	429	0.4	8.
			25 0825	26	0535	394	0.8	16.
			26 0540	27	0630	466	0.3	8.
			27 0805	28	0715	438	1.0	24.
			28 0845	29	0750	419	0.2	5.
			29 0920	30	0930	366	0.4	7.
			30 0630	1	0625	448	0.8	20.
		July	1 0740	2	0735	444	0.5	11.
			2 0930	3	0900	440	0.2	3.
			3 0945	4	0920	442	0.2	4.
			4 1015	5	0730	383	0.2	3.
			5 0810	6	0845	453	0.1	2.
			6 1115	7	0908	451	ND	N
			7 1015	8	1000	442	0.1	2.
			8 1230	9	1145	437	0.2	5.
			17 1900	18	1900	462	0.1	3.
Lindreth Plant(EPNG) New Mexico	432	June	28 0800	29	0800	487	0.2	4.
			29 0800	30	0800	465	0.3	5.
			30 0800	1	0800	485	0.6	14.
		July	1 0800	2	0800	522	0.2	4.
			2 0800	3	0800	522	0.1	2.
			3 0800	4	0800	522	0.1	3.
			4 0800	5	0800	522	0.1	2.
			5 0800	6	0801	526	0.1	2.
			6 0801	7	0800	522	ND	N
			7 0800	8	0800	520	0.1	2.
			8 0800	9	0800	522	0.1	2.
			9 0800	10	0800	520	0.1	2.
			10 0800	11	0800	524	0.1	2.
			11 0800	12	0800	520	0.1	2.
			12 0800	13	0800	520	0.1	3.
Allison, Colorado	433	June	25 0900	26	1100	523	0.5	14.
			26 1100	27	1100	485	0.2	5.
			27 1100	28	1100	497	0.5	11.
			28 1100	29	1100	497	0.2	5.
			29 1100	30	1100	497	0.5	10.
			30 1100	1	1100	497	0.3	8.

Table 2. Daily Air Sampling Results (continued)

Locations	Station No.	Sampling Period Start		Stop		Sample Volume (m^3)	Beta Activity (pCi/m^3)	Integrated Beta Activity ($pCi\text{-}hr/m^3$)
		Day	Hour	Day	Hour			
New Mexico ued)	430	June	23 0740	24	0730	446	0.2	4.9
			24 0830	25	0730	429	0.4	8.9
			25 0825	26	0535	394	0.8	16.8
			26 0540	27	0630	466	0.3	8.0
			27 0805	28	0715	438	1.0	24.2
			28 0845	29	0750	419	0.2	5.1
			29 0920	30	0930	366	0.4	7.2
			30 0630	1	0625	448	0.8	20.1
		July	1 0740	2	0735	444	0.5	11.5
			2 0930	3	0900	440	0.2	3.8
			3 0945	4	0920	442	0.2	4.5
			4 1015	5	0730	383	0.2	3.6
			5 0810	6	0845	453	0.1	2.1
			6 1115	7	0908	451	ND	ND
			7 1015	8	1000	442	0.1	2.6
			8 1230	9	1145	437	0.2	5.7
			17 1900	18	1900	462	0.1	3.1
Plant(EPNG)	432	June	28 0800	29	0800	487	0.2	4.5
xico			29 0800	30	0800	465	0.3	5.9
			30 0800	1	0800	485	0.6	14.4
		July	1 0800	2	0800	522	0.2	4.6
			2 0800	3	0800	522	0.1	2.2
			3 0800	4	0800	522	0.1	3.4
			4 0800	5	0800	522	0.1	2.4
			5 0800	6	0801	526	0.1	2.2
			6 0801	7	0800	522	ND	ND
			7 0800	8	0800	520	0.1	2.6
			8 0800	9	0800	522	0.1	2.2
			9 0800	10	0800	520	0.1	2.2
			10 0800	11	0800	524	0.1	2.2
			11 0800	12	0800	520	0.1	2.0
			12 0800	13	0800	520	0.1	3.2
Colorado	433	June	25 0900	26	1100	523	0.5	14.0
			26 1100	27	1100	485	0.2	5.6
			27 1100	28	1100	497	0.5	11.5
			28 1100	29	1100	497	0.2	5.5
			29 1100	30	1100	497	0.5	10.9
			30 1100	1	1100	497	0.3	8.2

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Table 2. Daily Air Sampling Results (continued)

Sampling locations	Station No.	Sampling Period Start		Stop		Sample Volume (m^3)	Beta Activity (pCi/m^3)	Integrat Beta Acti (pCi-hr/m
		Day	Hour	Day	Hour			
Allison, Colorado (continued)	433	July 1	1100	2	1100	497	0.5	13.1
		2	1100	3	1100	481	0.1	3.3
		3	1104	4	1100	485	0.2	4.4
		4	1100	5	1100	522	0.2	3.9
		5	1100	6	1900	671	0.1	3.6
		6	1900	7	1800	458	0.1	2.4
		7	1800	8	1800	447	0.2	4.1
		8	1800	9	0700	269	0.4	4.9
		9	0700	10	1900	725	ND	ND
		10	1900	11	1100	338	0.1	1.5
		11	1100	12	1300	539	0.2	4.1
		12	1300	13	1100	435	0.1	2.9
		13	1100	14	1700	628	0.2	7.4
		14	1700	15	1000	369	0.1	1.7
		15	1000	16	1000	503	0.2	4.6
		16	1000	17	1600	613	0.1	4.3
		17	1600	18	1100	392	0.1	2.2
Gobernador, New Mexico	434	June 21	1010	22	0900	447	0.1	2.3
		22	0900	23	0900	472	0.2	4.3
		23	0900	24	0900	472	0.1	2.9
		24	0900	25	0950	516	0.3	8.0
		25	0950	26	0950	495	0.4	10.4
		26	0950	27	0950	522	0.2	4.7
		27	0950	28	1000	524	1.1	26.1
		28	1000	29	1010	526	0.2	3.7
		29	1010	30	1000	517	0.2	5.8
		30	1000	1	1010	534	0.5	10.9
		July 1	1010	2	1002	469	0.3	6.4
		2	1002	3	1040	486	0.2	4.5
		3	1040	4	1040	470	0.1	2.5
		4	1040	5	1000	445	0.1	3.2
		5	1000	6	1005	464	0.1	2.5
		9	1515	10	1140	391	0.1	1.7
		10	1140	11	0940	422	0.1	1.2
		11	0945	12	0800	439	0.1	2.3
		12	0805	13	0835	470	0.2	4.2
		13	0840	14	0930	475	0.2	3.9

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Table 2. Daily Air Sampling Results (continued)

ocations	Station No.	Sampling Period Start		Stop		Sample Volume (m^3)	Beta Activity (pCi/m^3)	Integrated Beta Activity ($pCi\text{-}hr/m^3$)
		Day	Hour	Day	Hour			
olorado	433	July	1 1100	2	1100	497	0.5	13.1
)			2 1100	3	1100	481	0.1	3.3
			3 1104	4	1100	485	0.2	4.4
			4 1100	5	1100	522	0.2	3.9
			5 1100	6	1900	671	0.1	3.6
			6 1900	7	1800	458	0.1	2.4
			7 1800	8	1800	447	0.2	4.1
			8 1800	9	0700	269	0.4	4.9
			9 0700	10	1900	725	ND	ND
			10 1900	11	1100	338	0.1	1.5
			11 1100	12	1300	539	0.2	4.1
			12 1300	13	1100	435	0.1	2.9
			13 1100	14	1700	628	0.2	7.4
			14 1700	15	1000	369	0.1	1.7
			15 1000	16	1000	503	0.2	4.6
			16 1000	17	1600	613	0.1	4.3
			17 1600	18	1100	392	0.1	2.2
,	434	June	21 1010	22	0900	447	0.1	2.3
co			22 0900	23	0900	472	0.2	4.3
			23 0900	24	0900	472	0.1	2.9
			24 0900	25	0950	516	0.3	8.0
			25 0950	26	0950	495	0.4	10.4
			26 0950	27	0950	522	0.2	4.7
			27 0950	28	1000	524	1.1	26.1
			28 1000	29	1010	526	0.2	3.7
			29 1010	30	1000	517	0.2	5.8
			30 1000	1	1010	534	0.5	10.9
		July	1 1010	2	1002	469	0.3	6.4
			2 1002	3	1040	486	0.2	4.5
			3 1040	4	1040	470	0.1	2.5
			4 1040	5	1000	445	0.1	3.2
			5 1000	6	1005	464	0.1	2.5
			9 1515	10	1140	391	0.1	1.7
			10 1140	11	0940	422	0.1	1.2
			11 0945	12	0800	439	0.1	2.3
			12 0805	13	0835	470	0.2	4.2
			13 0840	14	0930	475	0.2	3.9

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Table 2. Daily Air Sampling Results (continued)

Sampling locations	Station No.	Sampling Period Start Day	Start Hour	Stop Day	Stop Hour	Sample Volume (m^3)	Beta Activity (pCi/m^3)	Integr Beta Ac (pCi-hr
Gobernador, New Mexico (continued)	434	July	14 0935	15	1040	498	0.1	2.4
			15 1045	16	1010	447	0.1	3.2
			16 1010	17	1005	470	0.1	2.2
			17 1009	18	0955	481	0.1	1.2
Farmington, New Mexico	445	June	28 1127	29	1035	395	0.4	8.9
			29 1035	1	0811	824	0.6	26.3
		July	1 0815	2	1115	484	0.4	11.8
			2 1118	4	1845	978	0.1	6.6
			4 1845	5	1133	296	0.2	3.4
			5 1140	6	0815	363	0.1	1.9
			6 0820	7	0827	425	ND	ND
			7 0830	8	0810	404	0.1	2.5
			8 0812	9	0925	492	0.1	1.7
			9 0930	10	0805	445	0.1	1.7
			10 0810	11	0925	496	0.1	2.0
			11 0930	12	1040	494	0.1	3.2
			12 1045	15	1045	1382	0.1	10.2
			15 1050	19	0803	1496	0.1	12.6

Detectable limit: Beta 0.1 pCi/m^3, based on 300 m^3 and 2-minute counting time.

Table 2. Daily Air Sampling Results (continued)

Locations	Station No.	Sampling Period Start Day	Start Hour	Stop Day	Stop Hour	Sample Volume (m^3)	Beta Activity (pCi/m^3)	Integrated Beta Activity ($pCi\text{-}hr/m^3$)
or, New (continued)	434	July	14 0935	15	1040	498	0.1	2.4
			15 1045	16	1010	447	0.1	3.2
			16 1010	17	1005	470	0.1	2.2
			17 1009	18	0955	481	0.1	1.2
on, xico	445	June	28 1127	29	1035	395	0.4	8.9
			29 1035	1	0811	824	0.6	26.3
		July	1 0815	2	1115	484	0.4	11.8
			2 1118	4	1845	978	0.1	6.6
			4 1845	5	1133	296	0.2	3.4
			5 1140	6	0815	363	0.1	1.9
			6 0820	7	0827	425	ND	ND
			7 0830	8	0810	404	0.1	2.5
			8 0812	9	0925	492	0.1	1.7
			9 0930	10	0805	445	0.1	1.7
			10 0810	11	0925	496	0.1	2.0
			11 0930	12	1040	494	0.1	3.2
			12 1045	15	1045	1382	0.1	10.2
			15 1050	19	0803	1496	0.1	12.6

limit: Beta 0.1 pCi/m^3, based on 300 m^3 and 2-minute counting time.

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Table 3. Special Air Sampling

Wind Condition	Sample No.	Date	Type	Air Volume Ambient m^3	H_2O Collected	^3H pCi	^3H pCi/ml	^3H pCi/m^3
Drainage	50279	7/9	Sieve	5.58	37 ml	384	11	69
Drainage	50250	7/12	Cryogenic*	2.25	15	60.7	4	28
Afternoon	48826	6/29	Cryogenic*	0.42	0.7	57	81	140
Afternoon	48825	6/29	Sieve	1.16	2	1,350	675	1,200
Afternoon	48983	7/2	Cryogenic*	1.28	10	76	8	59
Afternoon	50035	7/3	Sieve	4.93	50	800	16	160
Background Sample								
Afternoon	50280	7/9	Sieve	5.02	35	207	6	41

*All cryogenic samples were analyzed for radioxenon and radiokrypton. Neither was found in any sample.

Table 4. Water Sampling Results

Sample No.	Date taken	Location*	Tritium (pCi/l)	Gamma Scan
48892	6/24/68	NS - Pettus Ranch		Negligible
48893	6/27/68	15 - Drilling Water Pond, Gasbuggy Road and NM 17		Negligible
50283	7/16/68	14 - Well and Pond No. 1	900	Negligible
50281	7/16/68	NS - Pond No. 4, 0.2 mi W La Jara Wash Bridge on NM 17	700	Negligible
50282	7/16/68	15 - Drilling Water Pond	< 400	Negligible
50291	7/16/68	13 - Pond, 0.4 mi W Jicarilla - Carson Boundary	800	Negligible
50284	7/16/68	12 - Laguna Seca	< 400	Negligible

*Numbers 12 - 15 are as shown in Figure 2.

NS - Not shown.

Table 5. Soil and Vegetation Sampling Results
(All samples taken on 7/16/68)

LOCATION (Shown on Figure 2)	SOIL		VEGETATION*		(Rep-I)	(Rep-II)	Direction from SGZ	Distance from SGZ (mi)
	Number	pCi/ml of water content	Number	No. of Species	pCi/ml of water content	pCi/ml of water content		
1	050273	6.3±1.0**	050262	5	1.7±0.6	3.7±0.8	NW	0.3
2	050269	8.2±1.0	050264	3	3.3±0.6	2.5±0.6	NW	0.6
3	050272	1.8±0.6	050256	4	1.8±0.6	3.0±0.6	NW	0.9
4	050275	2.2±0.6	050261	3	3.7±0.8	3.1±0.6	NW	1.3
5	050274	3.9±0.8	050266	4	2.5±0.6	2.2±0.6	Trlr Pk	0.2
6	050270	4.7±0.8	050258	5	2.2±0.6	2.0±0.6	Trlr Pk	0.5
7	050271	15.7±0.8	050260	3	4.1±0.8	1.8±0.6	E	0.2
8	050268	4.4±0.8	050259	3	3.4±0.6	1.6±0.4	E	0.5
9	050276	6.0±1.0	050265	2	3.3±0.6	1.9±0.4	E	1.0
10	050267	4.5±0.8	050257	2	3.3±0.6	1.8±0.6	NE	1+
11			050263	5	2.4±0.6	2.2±0.6	NE	3.0

*Sample was divided and each portion analyzed separately. ** Based on 2σ counting error.

Species Found in Vegetation Samples

Sample No.	Species	Sample No.	Species
050266	Quercus gambelli, Purshia spp., two Compositae	050263	Chenopodiaceae, Labiatae, Salsola kali, Gramineae, Artemisia tridentata
050257	Chenopodiaceae, Boraginaceae	050262	Cruciferae, Compositae, Labiatae, Artemisia tridentata
050256	Artemisia tridentata, Compositae, Labiatae, Cruciferae	050264	Lupinus spp., Compositae, Artemisia tridentata
050265	Labiatae, Compositae	050261	Cruciferae, Compositae, Artemisia tridentata
050259	Quercus gambelli, Rosaceae, Juniperus spp.	050260	Compositae, Artemisia tridentata, Rosaceae
050258	Quercus gambelli, Juniperus spp., Boraginaceae Compositae, Cruciferae		

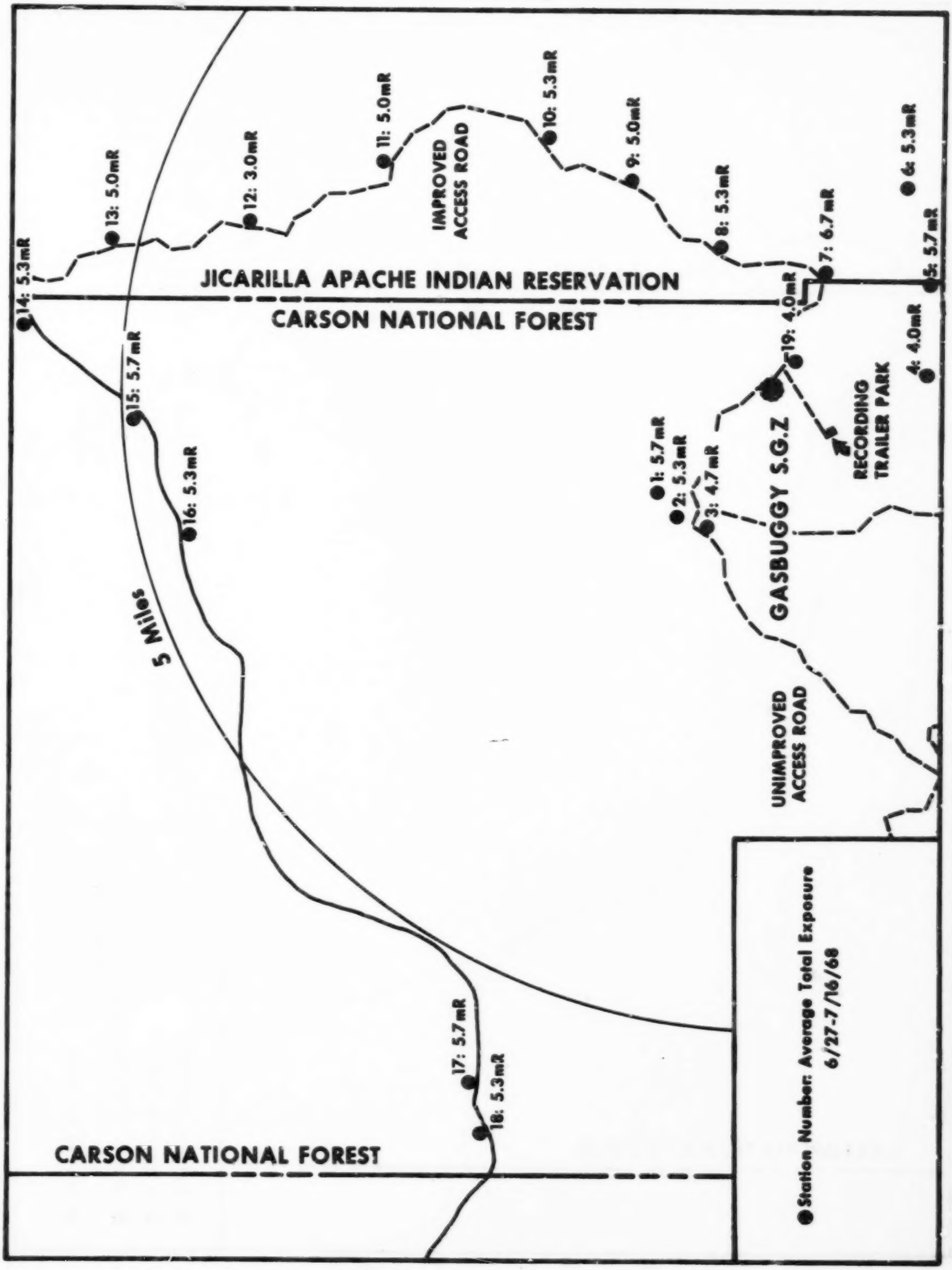

Figure 1. TLD Station Locations

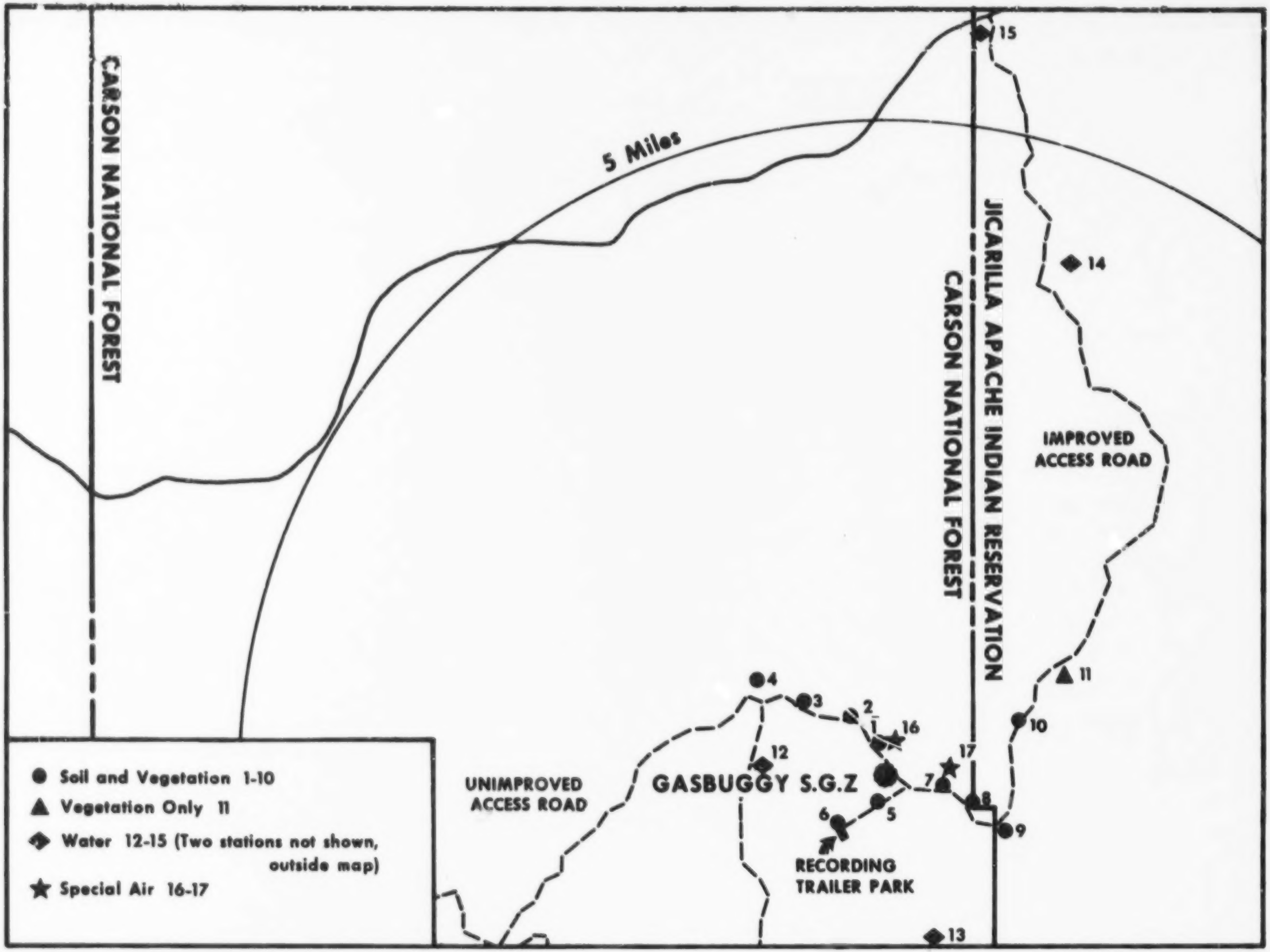

Figure 2. Sampling Locations